

Analyzing Cultural-Social Issues in Support of Military Applications

Dr. Stuart H. Starr, Distinguished Research Fellow

Center for Technology and National Security Policy, National Defense University
Lincoln Hall, Fort Lesley J. McNair, Washington, D.C. 20319-5066
USA

202-685-2657 (Phone), 202-685-3581 (FAX)

StarrS@ndu.edu

Dr. Michael J. Baranick, Senior Research Fellow

Center for Technology and National Security Policy, National Defense University
Lincoln Hall, Fort Lesley J. McNair, Washington, D.C. 20319-5066
USA

202-685-3590 (Phone), 202-685-3581 (FAX)

BaranickM@ndu.edu

ABSTRACT

During the development of the Analysis Modeling & Simulation (M&S) Business Plan, the area of cultural-social issues was characterized as “RED,” meaning current M&S capabilities supporting the analysis of cultural-social issues were insufficient to effectively address even a limited range of issues and questions confronting decision makers in this area. The information in this paper was designed to clarify the key issues associated with cultural-social issues and to recommend actions to mitigate key shortfalls. The information in turn is being incorporated in the Analysis Community’s M&S Business Plan, to help guide investment and research in this area over the next few years. To establish a foundation for this assessment, the paper begins by defining key cultural-social terms. That is followed by sections that identify the key questions that senior decision makers have formulated and characterize the nature of the problem. Subsequently, the paper identifies the key needs associated with cultural-social assessments. That is followed by sections that identify the key gaps that need to be addressed to pursue cultural-social assessments and on-going cultural-social assessments. The paper concludes by identifying three broad recommendations for the cultural-social community keyed to the risks associated with those issues.

1.0 CONTEXT

For the purposes of this paper, “cultural-social issues” are defined as follows: “modeling the behavior of individuals, groups, and societies to assess how they will respond to a variety of stimuli”. Consistent with that definition, senior decision makers have formulated an array of questions. These include:

- a) How do you conduct “war amongst the people”? (source: Sir Rupert Smith (reference 1))
- b) What are the roots of terrorism?
- c) What is the decision calculus of an adversary that we seek to deter?
- d) How will a crowd respond to a selected Course of Action (COA)?
- e) How will a society respond to a proposed strategic communication message?

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In addition, MG Michael Flynn, International Security Assistance Force (ISAF), has formulated several questions that will require insight about cultural-social issues. A representative set of those issues is summarized in Table 1.

Table 1: Selected Cultural-Social Questions.

Area	Key Questions
Social Attitudes	<ul style="list-style-type: none"> •How does the population interact as tribes? •How much of the population is affected, disaffected? •How does the population respond to strategic communication? •How is the population informed? •How do they like to be informed? •What are the preferences of people on a district level? •What efforts have historically been successful on a district level? •What kind of development do people prefer on a district level? •What part of the population is disaffected and why? What is the percentage?
Taliban-related	<ul style="list-style-type: none"> •How does the population relate to the Taliban as an organization, not as an insurgency? (e.g., how they operate and how people are affected by them as an organization) •How do we split the population away from the Taliban, especially in Helmand /Kandahar? •What narratives do the Taliban use to get popular support? •What tactics of intimidation do they use?
Rule of law	<ul style="list-style-type: none"> •How does the population define rule of law and justice? •How can we institute a sense of rule of law? •How can the central government more effectively dole out justice to be as swift as Sharia law?
Economics	<ul style="list-style-type: none"> •What is the importance of the poppy trade to the Afghan population? •How does the government corruption impact the Afghan population and its relation to drug trade?
Governance	<ul style="list-style-type: none"> •How does the population accept and see governance? •How is the population's historical response to governance, not being governed, and warlordism?
Security	<ul style="list-style-type: none"> •How will the population respond to the new Stryker brigade that is coming in? •How does the population respond to basic force maneuvering?
Visualization	<ul style="list-style-type: none"> •How can we visualize/layer data from geography through population dynamics?

Consistent with that definition and representative questions, we have formulated the following vision for this set of issues:

“Social scientists working in concert with operations analysts to develop and validate conceptual and instantiated cultural-social models.”

2.0 KEY CULTURAL-SOCIAL NEEDS

In accordance with that vision, cultural-social analysis needs were decomposed into twelve interrelated categories. As noted in Figure 1, “Framework for Cultural-Social Modeling,” the driver for the needs arises from the representative questions from senior decision makers, the box on the left hand end of the arrow in the figure. The middle of the arrow includes four key categories from left to right of shared needs between the Social Sciences and the Operations Research disciplines: data, VV&A, education and training, and outreach. Four additional categories are of particular concern to the social sciences, captured by the four boxes in the top of the diagram: definitions, basic research, Measures of Merit (MoMs), and theories. The four categories in the boxes in the bottom of the diagram are of particular concern to operations researchers: tools, representation in tools, exploration of “possibility space,” and design of experiments. The results of activity in the all the boxes generates enhanced methodologies and can be used to feed a new round of representative questions. The analysis needs associated with each of the twelve categories shown on the arrow are summarized below.

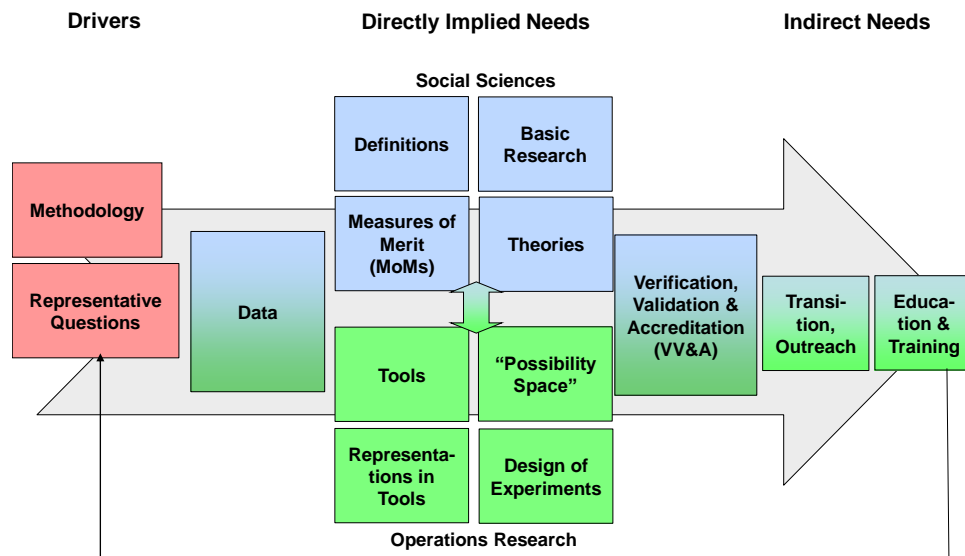


Figure 1: Framework for Cultural-Social Modeling.

2.1 Data Needs

There are at least three basic data issues. First, existing cultural-social activities data sets are diffused, difficult to find and hard to access. Second, much of the data lack necessary information to support analysis (such as adequate metadata, indications of pedigree, and standard definitions). Finally, the available data are rarely ready for use; they require substantial clean up and conversion to fit current desired analytic applications.

To address these issues, six key themes were identified for data needs. First, appropriate cultural-social activity taxonomies and ontologies must be developed. Second, collaborative efforts to *tailor* cultural-social activities data to satisfy the intended purposes must be implemented. Third, verification and validation (V&V) efforts to ensure data integrity, consistency, reliability, source documentation are retained as metadata must be performed and recorded. Fourth, to avoid "stale" data, local and national data must be updated with appropriate periodicity. Fifth, data must be captured in many dimensions to support the complexity of the questions being asked in this arena. A partial listing suggests that we need data in the areas of the environment, medical and health experiences, attitudes across a range of issues, affiliations, and legal systems. A final theme, given the dispersion of the data, is that analysts and decision makers should explore the desirability of a Central Cultural-Social Activities Data Repository. Such a Repository could be stored in relational formats and informed by a dedicated study that would address a variety of issues including classification, access, open source data, legal issues, granularity, qualitative data, maintenance, and dissemination.

2.2 Definition Needs

Selected social scientists have identified several basic definition issues. First, many definitions describing irregular warfare (IW) and related activities are too vague and ambiguous for social scientists to use effectively; for example, “counterinsurgency” requires both an understanding of what is meant by the insurgency terminology and an understanding of what groups, what actions and what goals might be associated with countering this state. Second, many definitions are discipline-specific and not uniformly understood across disciplines, for example “development” has very different meanings to economists, psychologists, and political scientists. Consequently, the social scientists need to work with historians and operations research scientists to develop more specific definitions and define commonalities across disciplines that can facilitate communication and drive common action. Specifically, there is a need to develop a variety of products which would include a library of ontologies, semantic descriptions, a thesaurus, a dictionary, data lexicons with metadata, and standards. Developing these products would serve to address definition needs while overlapping with the actions to address data needs, cited above.

2.3 Measures of Merit (MoMs) Needs

Historically, the operations analysis community has been comfortable with the concept of formulating MoMs subsuming Measures of Performance (MoPs) and Measures of Effectiveness (MoEs). However, practitioners of the social sciences are less familiar with this approach and many are not prepared to agree that a set of measures at a micro-level of a problem can be combined or serve as inputs into approaches addressing a parallel problem at a macro-level. Thus, we need to tailor the MoMs cultural-social activities to develop understandings about when and under what conditions key MoPs and MoEs can be linked to MoMs and when they cannot. Furthermore, we need to display cultural-social area MoMs to senior decision makers in a fashion that conveys appropriate levels of uncertainty and risk associated with both the measures themselves and their ability to capture important aspects of the specific issue being addressed.

2.4 Theory Needs

The social sciences have formulated competing theories for many subjects of interest. For example, understanding the root causes of terrorism was but one of many examples for which there is no single clear-cut theory available to explain observed behavior at all levels. In addition, there are key areas where needed theories are not available, or if they are available, too specific for the intended application, or too general to be used meaningfully. Where multiple theories exist, the community needs codes of best practice/guidelines on which theory to use and when. As noted, there are many areas where the social sciences have not yet developed theories in forms useful for cultural-social applications. The various members of the social science and historian communities need to develop appropriate theories to address these key gaps or mismatches.

2.5 Basic Research Needs

There are many areas of interest to national security where basic research in the social sciences must be performed to support cultural-social activities. For example, we need studies of influencers on attitude/behavior of civilians based on ethnic, tribal, cultural, religious, and political considerations. As a starting point, researchers in this area need to develop a comprehensive list of those issues, questions and topic areas where basic social science research is needed and to prioritize this list from a national security perspective.

2.6 Representations in Tools Needs

Selected operations analysts have attacked the cultural-social representation in tools issue by asking an initial question regarding what real-world factors the Community wanted such tools to represent. This can range from issues at the tactical level, where small unit behavior can generate a range of responses within groups in the population to strategic issues that cover the entire Diplomatic-Informational-Military-Economic (DIME)/Political-Military-Economic-Social-Infrastructure-Information (PMESII) spectrum. While no one tool is required to cover the entire spectrum, a set of tools should provide clear linkages between levels of analysis and focus areas to support coherent study. However, one must not “mirror-image” adversaries or insurgents using observed behavior or reactions associated with US or European norms. Modelers need solid data and theories as well as creativity to model US and its allies as well as the cultural-social elements of other engaged or indigenous groups. The operations research analysts also recognized a tendency on the part of their discipline to decompose social scientists and their knowledge into the categories of “micro” and “macro” representations. This is an artificial distinction that, if made, requires feedback between “micro” and “macro” representations (perhaps through “meso” perspectives). Overall, phenomena must be studied and captured from multiple perspectives. These include organizational performance, cultures and institutions, all types of operations, and the situational awareness of all parties regarding other actors and activities.

2.7 Tools Needs

The analysis community requires an expanded set of cultural-social activity tools that acknowledge three key issues. First, the analysts agreed that there is no such thing as a “silver bullet” model that will satisfy the full range of cultural-social activity modeling needs. A comprehensive tool solution will require a number of models that can each deal with specific aspects of the cultural-social study space and establish context for models exploring other cultural-social issues. Second, many existing cultural-social activity tools are too limited in their scope (for example, counterinsurgency tools can not address multiple insurgencies, simultaneously). Third, we are at the beginning of the tool building process, using tools to help develop insight on how various actions and attitudes influence basic outcomes—such tools are exceptionally limited in their ability to forecast when addressing cultural-social activity issues.

These caveats aside, there is some clarity regarding the needs associated with cultural-social activity tools. First, the community requires a cultural-social activity Modeling Test Bed to support analysis activities. Such a Modeling Test Bed could be in a single location or distributed among a number of participating organizations and activities, but it needs to be available to facilitate the test and operation of different tools and databases in different conditions in a consistent manner to ensure improved understanding and application across the community. However, the proper architecture/framework for these cultural-social activity tools is an open question. The suite of tools should include a balanced mix of techniques that take advantage of the strengths of the tools while ameliorating their weaknesses (for example, developing a set of system dynamic models, agent based models, and wargames that feed results to each other and are developed in concert); consider creating a “collaborative environment” in which selected models can be linked / federated and evaluated (particularly with respect to “precision”); consider the use of a “service bus” or Global Information Grid (GIG) for data repositories; ensure that models are tailorable to address specific levels of aggregation or focus on specific aspects of the cultural-social enterprise; employ hierarchical modeling with meta-model/meta-data aggregation/disaggregation; and assemble a resource repository of models and data.

2.8 “Possibility Space” Needs

The discussion of cultural-social needs started with the development of representative questions that are or

might be posed by senior decision makers. Such questions could potentially be of infinite variety, which means the specific questions used must usefully clarify the area where cultural-social activity modeling should be used to explore the “possibility space.” Note that not all models need to “forecast” things and in fact, as much as accurate forecasting may be desired, the first step is to use models to gain better insight and understanding. In fact, “forecasting” may mean likelihoods of occurrence of multiple possible events. For example, at least four possible levels of forecasting could be envisioned. These include: “hard” forecasts of events (with “error bars” to characterize uncertainty); “soft” forecasts of likelihoods (e.g., for multiple possible results); explorations of possibilities (e.g., “what if...?”); or forecasts that basically inform situational awareness and understanding.

2.9 Design of Experiments Needs

Many social scientists are not familiar with efficient, effective designs of experiments. We should draw on the insights developed in academia (such as at the Naval Postgraduate School’s SEED Center for M&S characterized by large numbers of variables) to characterize the interesting parts of response surfaces using innovative experimental designs (e.g., focused fractional factorial designs).

2.10 Verification, Validation & Accreditation (VV&A) Needs

There is a critical need to perform VV&A for cultural-social activity models. Consistent with that observation, four key issues were cited. First, most creators of cultural-social activity M&S and selectors of data do not accomplish V&V in a way that can be replicated by others to improve confidence in the resultant M&S. That said, because many of the phenomenologies associated with cultural-social issues are not yet fully observed, let alone organized into theories with supporting databases, the community needs to broaden the concept of V&V to address theories and selection of subject matter experts (SMEs). Regardless of the maturity of the theories or resultant models, developers and users need to initiate the VV&A process even when key issues are still unresolved to ensure the development of precise definitions, levels of accomplishment, and clear descriptions of pitfalls. Finally, the initial look at this area suggests that V&V of DIME/PMESII data are significantly more complex than V&V of combat model data, which means initiating appropriate VV&A activities early will assist in helping the community understand better when and how specific tools can be used.

To achieve the objective of improved VV&A for cultural-social activity models, there is a need to generate guidelines that enable researchers to perform V&V credibly, with acceptable levels of resources. Historically, the operations research community has focused on V&V of models and data. However, the social sciences pose an additional challenge which includes the V&V of relevant theories and SMEs. Note that the V&V process must be clearly documented in order to facilitate implementation of the accreditation function. The same requirement should be extended to HSCB using V&V to create “tags” for theories, methods, models, and data that will enable the retrieval of desired items when needed. This should be associated with the creation of “open data” on the detailed VV&A status of theories, models and databases.

2.11 Education and Training Needs

Several education and training needs must be addressed. First, there is a need to augment the curriculum for social scientists, operations analysts, and operational users to give them adequate education to enhance cross-discipline communication. Second, a cultural-social activity Community of Interest/Community of Practice (CoI/CoP) must be created and sustained to foster high performance, multidisciplinary teams. This CoI/CoP should provide continuity of action using a variety of approaches (e.g., electronic interaction; virtual meetings

and workgroups; face-to-face interactions). This continuity might be achieved by building on the proposed Social Science CoI/CoP of the Military Operations Research Society (MORS) or by leveraging JFCOM's proposed CoI/CoP or both. Third, there is a need to educate senior decision makers about the community's current and projected capabilities to perform cultural-social activity modeling and particularly about the gaps that limit the community's ability to produce robust insights in this area. At a minimum, there is a need to develop a "check list" that will enable senior decision makers to better characterize the key questions that they pose to the analysis community as well as "rules of thumb" to evaluate the responses to those questions.

2.12 Outreach Needs

There are a number of areas where outreach could assist the military analysis community to better connect to those beyond the traditional national security study arena. In particular, there are three areas where enhanced cultural-social activity modeling outreach are needed. First, it is recommended that the expansion of the cultural-social activity CoI/CoP should include balanced interagency participants to include the National Security Council, the US Institute of Peace, the Department of State, the Department of Justice along with non-governmental organizations. Second, the cultural-social community needs to participate actively in international forums that address related activity modeling issues. These would include NATO initiatives on cultural-social activities (e.g., NATO SAS-071 and NATO SAS-081; NATO M&S Group (NMSG) conferences). Finally, there is great sensitivity to the attitudes of many members of the social sciences community who have suggested that is unethical to work with the Department of Defense (DoD). To address that issue, the community needs to develop a compelling narrative to explain the value of a collaborative relationship between the social sciences community and DoD.

3.0 EXISTING CULTURAL-SOCIAL TOOLS

The analysis community has determined that there is a need for an orchestrated and relevant cultural-social tool kit to address the issues posed by senior decision makers. Table 2, "Representative Cultural-Social Tools of Interest", identifies an array of contemporary tools that exist and are being enhanced. These tools subsume traditional M&S, wargaming, seminars, agent-based models, system dynamics models, non-DoD methods (such as game theory and economic forecasting), DIME-PMESII M&S, collaborative tools, tools to support cost-benefit analyses and risk analyses, databases, and Whole of Government/Whole of Society models. In general, the analysis community is interested in developing methodologies that harmonize the use of wargames and seminars with selected M&S tools. However, as discussed below, it is understood that most of the existing tools are extremely immature.

Table 2: Representative Cultural-Social Tools of Interest.

Type	Examples	Selected Users
Traditional M&S	DIAMOND	DSTL
Wargaming	Peace Support Operations Model (PSOM) Integrated Gaming System	UK, PA&E, J8 TRAC-FLVN
Seminars,...	MAPEX SENSE	PA&E IDA
Agent Based Modeling	Pythagoras Cultural Geography Multi-Agent System	MCCDC TRAC-MTRY
System Dynamics Models	COIN	PA&E, J8
Non-DoD methods	Game theory Forecasting for economics	RAND, NWC
DIME-PMESII M&S	COMPOEX Senturion SEAS	DARPA, PA&E OUSD(Policy) JFCOM
Collaborative tools	Delphi methods	RAND
Cost-benefit, Risk	Multiple	
Databases	COIN Intellipedia	CAA PA&E
Models	Interim Semi-Static Stability Model (ISSM) Measuring Progress in Conflict Environments (MPICE)	DMSO Army Corps of Engineers

4.0 KEY GAPS

Figure 2, “Selected Cultural-Social Gaps”, provides a qualitative assessment of the current gaps as determined by the participants in the National Defense University’s “Workshop to Identify Human, Social, Cultural Behavior (HSCB) Modeling Needs.” (Reference 2). This assessment concludes that gaps exist in every area, with some of the largest gaps occurring in data; VV&A; transition/outreach; basic research; and exploration of “possibility space.” It also notes that there are major gaps in the relationship between the social science, operations analysis, and operational user communities. Similarly, there are significant gaps in the areas of theories, representation in tools, and education and training. Furthermore, the other key areas (e.g., definitions, MoMs, and Design of Experiments) are characterized by shortfalls. In the following discussion, we have employed the TRAC IW Methods, model, Analysis Working Group (reference 3) (MmAWG) algorithm which uses risk and resource requirements to prioritize activities.

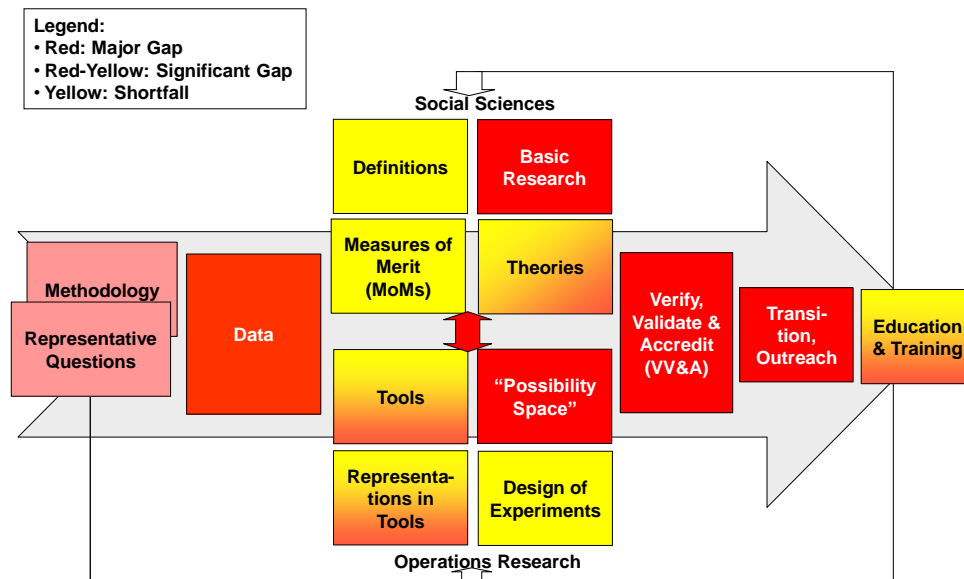


Figure 2: Selected Cultural-Social Gaps.

5.0 RECOMMENDATIONS

The following preliminary actions are recommended for activities that range from extremely high risk through activities that involve significant risk.

5.1 Extremely High Risk Recommendations

At the highest level of priority, the following preliminary actions are recommended for activities that have extremely high risk (i.e., severity – catastrophic; frequency – frequent). We have made a rough order of magnitude estimate of the resources needed to deal with each gap.

- **Create Multidisciplinary teams.** “Bridge the gap” between the social sciences and operations analyses by incorporating experts from both communities on joint study teams (medium resources).
- **Address data shortfalls.** Assemble, convert, and make accessible needed data and address residual data issues (e.g., metadata, pedigree) (high+ resources).
- **Establish credibility.** Implement feasible VV&A processes for theories, tools, data, and SMEs (low resources for single events, but high resources to connect across events and provide a more useful approach and documentation of results).
- **Enhance transition.** Ensure that key social sciences / operations analysis methods, tools, and data are transitioned to key users (e.g., analysis, operations) (high+ resources).
- **Perform Basic Research (social sciences).** Undertake efforts to deal with myriad unresolved social sciences issues (e.g., theories of “trust”, “corruption”) (high+ resources).

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- **Enhance the exploration of “possibility space”.** Clarify the extent to which tools can support “hard” and “soft” forecasting (medium resources).

5.2 High Risk Recommendations

At the next level of priority, the following preliminary actions are recommended for activities that have high risk (i.e., severity -- catastrophic to critical; frequency -- frequent to likely). Again, we have made a rough order of magnitude estimate of the resources that are needed to deal with that gap.

- **Complete social science theories.** Undertake efforts to generate needed social science theories which are missing or inadequate (high+ resources).
- **Generate additional tools.** Create tools needed to address issues posed by senior decision makers and operational users (high+ resources).
- **Improve representation in tools.** Ensure that tools adequately address cultural-social factors (high+ resources).
- **Enhance education & training.** Undertake education for practitioners so that they create and sustain effective multidisciplinary teams (high resources). In addition, provide education and training for senior decision makers so that they have “check lists” to be “educated consumers” (high resources).

5.3 Significant Risk Recommendations

At the final level of priority, the following preliminary actions are recommended for activities that have significant risk (i.e., severity -- catastrophic to critical; frequency -- frequent to likely). Again, we have made a rough order of magnitude estimate of the resources that are needed to deal with that gap.

- **Clarify Definitions.** Develop unambiguous definitions of key terms to drive the research agenda (low resources to develop, but significant coordination activities to implement).
- **Formulate useful MoMs.** Create tailored MoMs and develop “cause and effect” relationships linking MoPs, MoEs (high resources).
- **Employ effective Designs of Experiments.** Exercise key tools using experimental designs that are efficient and effective for large numbers of variables (medium resources).

6.0 SUMMARY

The challenges associated with cultural-social issues are substantial. This paper has identified twelve needs that must be addressed to enhance our ability to perform cultural-social assessments. Based on a risk assessment, it concludes that three classes of activities should be undertaken to mitigate the major cultural-social shortfalls.

7.0 APPENDICES

7.1 Appendix A: Selected M&S Gaps

This paper has not explicitly identified the gaps that the M&S community faces in promoting use and reuse of key products. However, several of the preliminary M&S Business Plans (e.g., analysis, planning, acquisition,

acquisition) do identify several of the major gaps that the community faces. Table A-1, “Selected M&S Gaps”, identifies a selected set of the major gaps in the areas of Use and Reuse and Technical Framework. That table suggests some of the initiatives that must be pursued to mitigate those shortfalls.

Table A-1: Selected M&S Gaps.

Area	Selected Gaps
Use, reuse	<ul style="list-style-type: none"> • US Government acquisition guidelines don’t promote use or reuse • It is difficult to discover, obtain reusable resources (e.g., lack of metadata) • Many key analysis M&S resources are not subjected to effective configuration management
Technical framework	<ul style="list-style-type: none"> • There is no consensus or responsibility for integrated architectures • There is no standard for interchanging system engineering (SE) information • There is no conceptual framework for data exchange • Architecture development is lagging, not-collaborative, and does not exploit commercial-off-the-shelf SE tools

7.2 Appendix B. References

- [1] GEN Sir Rupert Smith. “The Utility of Force”
- [2] National Defense University’s “Workshop to Identify Human, Social, Cultural Behavior (HSCB) Modeling Needs.”
- [3] Irregular Warfare Methods, Models, and Analysis Working Group, TRADOC Analysis Center, 2009.

